

Postdoctoral Researcher Position Funded by the ANR PhotoSynth

Visible-Light Driven Synthesis of Semiconducting Polymers

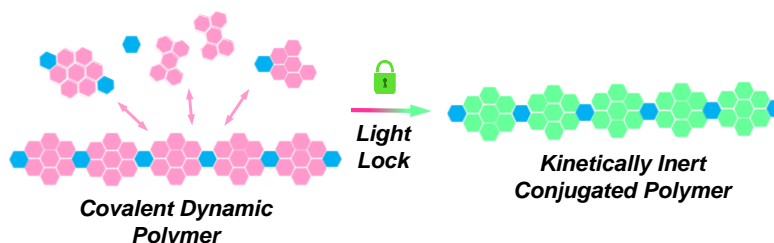
Location: MOLTECH-Anjou Laboratory, Université d'Angers, France

Supervisor: Dr. Antoine GOUJON

Duration: 1 year (renewable 1 year), ideally starting January 2022.

The project: Organic electronics are on the rise and conjugated polymers found their spot in devices ranging from organic solar cells, organic-field effect transistors or thermo-electrical conversion devices for example. Organic semiconducting polymers present several advantages over their small-molecules counterparts e.g. superior mechanical properties, high extinction coefficient and advantageous processability. However, their preparation relies on Pd-catalyzed couplings requiring many reactants - the use of toxic tin derivatives, additives, catalysts, etc... sometimes hard to completely remove from the final material and leading to a poor atom economy. Moreover, these reactions come with intrinsic drawbacks and undesired side reactions such as reduction, homocoupling or β -branching. These limitations are at the origin of large batch-to-batch variations in term of polymer properties and performance hindering the mass production of organic electronic devices.

PhotoSynth will explore the use of a light-locked condensation recently discovered in our group to prepare n-type conjugated polymers. The reaction only releases water as a side-product and does not require the use of additives or metal catalyst. It combines a rylene diimide derivative with an opto/electro-active bis-aldehyde building block of choice, exposed to white light, and can be performed at room temperature. This strategy proceeds in two steps, a first reversible condensation followed by an irreversible photo-reaction. Dynamic covalent polymers will be grown in different conditions and white light will be used to "lock" the systems into the final conjugated structures. The goal will be to open a path toward the synthesis of green, cheap and tuneable electron-deficient semiconducting materials, which diversity of structure and properties still lag behind their electron-rich counterpart.



The position: The work will focus on the development of a light-driven polymerization methodology to prepare conjugated semiconducting polymers in photo-reactors in flasks and flow-chemistry systems. The influence of the reaction conditions on the polymer properties will be explored and rationalized, combining concepts from dynamic covalent chemistry, polymer chemistry and conjugated systems synthesis. The optical, electronic and structural properties of the materials of interest will then be characterized (in solution and films), and the best candidates will be tested as active components of organic electronics devices (in particular OFETs and OSCs).

Profile: The ideal candidate has experience in the synthesis, purification and characterization (spectroscopy/electrochemistry) of conjugated polymers/molecules. Experience in the preparation and measurement of OSCs and OFETs would be highly appreciated but is not a requirement.

How to apply: An email should be addressed to antoine.goujon@univ-angers.fr, with « **Postdoc Application ANR** » as the subject. The applicant will attach a CV including a list of publications, a short (**max** 2 pages) research summary, and the contact of 2 references he/she worked with.

The MOLTECH-Anjou Laboratory is focused on the preparation of functional organic materials (with an emphasis on organic electronics) and is fully equipped to go from their design to their characterization and integration into devices. Angers is a medium-sized city located 1h20 from Paris by high-speed train and 1h30 from the Atlantic Ocean by car or train. A lively city with a low cost of living, surrounded by nature, rivers and beautiful vineyards, Angers is a city recognized as offering a high quality of life.